Research Report 2000

**Goal Planning and Pursuit:
Mobile Application Development and Evaluation**

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**U.S. Army Research Institute
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14. ABSTRACT

This research focused on developing and evaluating mobile applications to compare two approaches for goal planning and pursuit in an Army institutional training context. One mobile application applied the Army's traditional SMART goals approach. The other applied the mental contrasting and implementation intentions approach, a streamlined version of the SMART approach. The evaluation was conducted with Noncommissioned Officers enrolled in Advanced Leaders Courses. While the mobile application development process was successful, resulting in two research products, the evaluation yielded very low response rates. Recommendations and lessons learned for the evaluation of mobile applications in an Army training context are presented.

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GOAL PLANNING AND PURSUIT: MOBILE APPLICATION DEVELOPMENT AND EVALUATION

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army is invested in developing strategies to engage Soldiers in self-learning and self-development. The Army Learning Model (ALM) emphasized learner-centered instruction and life-long learning through self-development (Department of the Army, Training and Doctrine Command, 2011). To assist Soldiers in pursuing goal-centered self-learning, this research developed mobile applications in order to compare two goal planning and pursuit techniques. One mobile application used the Army's current SMART (i.e., Specific, Measureable, Action-oriented, Realistic & Relevant, Timely) goals approach. The other was designed around mental contrasting and implementation intentions, an alternative to SMART goal planning techniques that has produced promising results in traditional academic settings.

Procedure:

The researchers developed two goal setting and goal pursuit applications for hand-held devices and then compared the effectiveness of these applications with Noncommissioned Officers enrolled in Advanced Leaders Courses at Fort Leonard Wood, MO. The media design entailed presenting the steps to guide Soldiers through the process of mental contrasting and implementation intentions using a mobile application. The application was developed in both iOS (iPhone) and Android versions. This application, entitled Army Achieve, consisted of five key steps for identifying goals, outcomes, obstacles, actions to overcome obstacles and formulation of an if/then plan for goal pursuit. The application also included a method for tracking goal progress and a short evaluation questionnaire to be completed by participants when evaluating the application.

For comparison, an additional mobile application was development based on the Army Goal Book (Department of the Army, Army Center for Enhanced Performance, n.d.). This application used the traditional SMART goal planning and pursuit strategy. The application consisted of steps involving the identification of a long-term goal, key strengths and skills related to the goal, obstacles to achieving the goal, priority for development, key actions and beliefs that would aid in reaching the goal, related short term goals, and a means to keep the goal and other information in mind while pursuing the goal. The same questionnaire used in Army Achieve was included in the user evaluation for this application.

Noncommissioned Officers (NCO) enrolled in Advanced Leaders Courses (ALC) at the Fort Leonard Wood NCO Academy (NCOA) participated in this research. The participants met with the researchers in a classroom at the NCOA. Participants were briefed on the experiment and were able to download the application through the classroom's wireless network. NCOs who consented to participate downloaded and installed the mobile application onto their phones.

Findings:

The participants were instructed to complete the basic goal setting requirements of their application and to return the application evaluation by email at the end of their course. A total of 113 students participated in the application orientation sessions and consented to participate. At the end of the evaluation period, nine (9) evaluations were returned. Due to the small number of evaluations returned by participants, no in-depth analyses concerning the relative effectiveness of each approach are presented. The limited data did not indicate a measurable difference between applications in terms of their overall user evaluation scores.

In the orientation sessions, however, a number of useful suggestions were made. The evaluation presented here focuses on feedback from participants, specifically related to the need to tie a goal planning application to existing Army systems, such as the Army Career Tracker, and allowing for more interactivity and feedback from the application as far as scheduling of goals, reminders and other information that may aid in the completion of the goals. Finally, lessons learned and recommendations are presented concerning the distribution and evaluation of mobile applications in an Army training context.

Utilization and Dissemination of Findings:

Results of the research were provided to the Institute for Noncommissioned Officer Professional Development. This report describes the mobile applications development procedures and provides detailed descriptions of the page/screen content and screen captures for both applications developed for this project. The principal utilization of this report is for future development of mobile applications and recommendations for conducting field evaluations of mobile applications. We also include recommendations to potentially improve evaluations which require input from Soldiers over an extended time period or independent of an onsite, scheduled data collection period.

GOAL PLANNING AND PURSUIT: MOBILE APPLICATION DEVELOPMENT AND EVALUATION

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Goal Planning and Pursuit: Mobile Application Development and Evaluation

Introduction

The U.S. Army is invested in developing strategies to engage Soldiers in self-learning and self-development. The Army Learning Model (ALM) emphasizes learner-centered instruction and life-long learning through self-development (Department of the Army, Training and Doctrine Command, 2011). To assist Soldiers in pursuing goal-centered self-learning, this research developed mobile applications in order to compare two goal planning and pursuit techniques. One mobile application applied the Army's current SMART (i.e., Specific, Measureable, Action-oriented, Realistic/Relevant, and Timely) goals approach. The other application was designed around mental contrasting and implementation intentions, a streamlined alternative to SMART goal planning strategies, which has shown promise in traditional academic settings (Gollwitzer, Oettingen, Kirby, & Duckworth, 2011).

Background on the Research Problem

Soldiers face a number of developmental responsibilities. Among others, these responsibilities include learning and maintaining their technical skills, developing as a leader, maintaining their physical fitness, and adhering to Army values. With rapid deployment cycles, abbreviated training opportunities, and ambiguous self-development requirements, Soldiers are challenged to maintain the balance between mission accomplishment and their career- and self-development needs. To address the need for continuous learning and growth among Soldiers, the Army is looking to technological innovations, such as mobile device applications, to assist in balancing these demands.

The Army Learning Model (ALM) has focused on increased responsibility for Soldiers to learn on their own in a life-long learning, professional development context (Department of the Army, Training and Doctrine Command, 2011). Moreover, ALM encourages the use of digital applications to provide learning opportunities and support Soldiers' self-guided learning needs. A key aspect of this strategy is self-motivation and goal pursuit. Our research focused on self-motivation and goal pursuit to assist Soldiers in identifying developmental goals and finding strategies to reach their goals both within and beyond institutional training.

While the emphasis on the Soldier's role in their own development is apparent, recent surveys of Army personnel continue to indicate concern over the time allocated for self-development activities (Steele, 2011). Self-learning represents a powerful supplement to institutional and unit training; however, it can be challenging for Soldiers to manage the time required for concentrated self-directed learning (Graves, Rauchfuss, & Wisecarver, 2012).

One method to address Soldiers' expectations related to self-development is to provide tools to support their self-directed learning pursuits. In fact, recent Army efforts have identified methods for addressing these expectations. For example, the Connecting Soldiers to Digital Applications project sought to investigate opportunities to integrate mobile devices and applications with Soldier administrative, training, and tactical functions and led to the development of a host of training and personal effectiveness applications (Dragon & McCarthy,

2012). Mobile applications of all kinds are emerging to assist individuals and teams become more efficient and disciplined in their personal and professional development.

Approaches to Goal Planning and Pursuit

Goal setting theory has been shown to be an effective self-development strategy across a range of performance domains (Locke & Latham, 2002). Setting specific, challenging goals can motivate a person to achieve desirable objectives. Research related to self-regulation of behavior change has revealed a number of best practices related to how a person can achieve behavior change by effectively pursuing carefully selected goals (see Locke & Latham, 2002).

SMART Goals Approach. The U.S. Army has embraced the value and use of goal setting in doctrine and practice. Various Army Goal Books (Department of the Army, Pamphlet 350-1-2, 2010; Department of the Army, Army Center for Enhanced Performance, n.d.), include goal planning and pursuit information as part of the Comprehensive Soldier Fitness program.[1] The goal planning and pursuit strategies and processes included in the Army Goal Books are based upon what is commonly known as SMART goal setting. SMART is an acronym that represents the five key characteristics of goals that have been supported in the goal setting literature. Goals are most likely to be achieved when they are Specific, Measurable, Attainable, Realistic and Time bound (Doran, 1981).

Mental Contrasting and Implementation Intentions Approach. A self-regulation strategy that has been shown to help people wisely select and pursue goals is *mental contrasting* of what they anticipate for the future with their current situation (Oettingen, 2000, 2012; Oettingen, Pak, & Schnetter, 2001). People who employ mental contrasting first imagine having attained a desired future outcome (e.g., do more exercise) and then imagine what in their present situation impedes them in attaining their desired future state (e.g., feeling tired). When chances of success are high, mental contrasting helps goal-seekers pursue their goals; when chances of success are low, mental contrasting helps goal-seekers revise their goals in order to pursue more promising alternatives.

Various lines of research have attested to the effects of mental contrasting on wise goal pursuit across a variety of life domains, including scholastic achievement (Gollwitzer, Oettingen, Kirby, & Duckworth, 2011), health (Armitrage, 2004; Sheeran, Harris, Vaughan, Oetttingen, & Gollwitzer, 2012), and interpersonal relationships (Oettingen, Stephens, Mayer, & Brinkmann, 2010). In addition, the effects of mental contrasting have been efficacious across the life span (Oettingen, 2000), across socioeconomic statuses and cultures (Armitage, 2004; Sheeran, Harris, Vaughan, Oetttingen, & Gollwitzer, 2012), for short-term and long-term goal pursuits (Oettingen & Gollwitzer, 2010), and for the pursuit of approach goals as well as avoidance goals (Houssais, Oettingen, & Mayer, 2013). The effects have been replicated for a wide variety of indicators of goal pursuit (e.g., cognitive, emotional, and behavioral).

Selective pursuit of desired outcomes is only a first step to successful goal attainment (Gollwitzer & Oettingen, 2012). Especially when goal pursuit becomes highly complex, people often fail to get started (i.e., procrastinate), fail to stay on track (i.e., get distracted), fail to cease

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[1] See http://csf2.army.mil/ for additional information on these programs.

futile goal striving (i.e., overcommit), and fail to prevent overextension (i.e., do too much). Successful goal attainment may not only require individuals to select goals that are both desirable and feasible, but also to cope effectively with a number of challenges on the way to goal attainment.

One strategy that has been shown to help individuals take control of goal implementation is planning out one's goal striving in advance using if-then plans (i.e., implementation intentions, Gollwitzer & Brandstätter, 1997; Gollwitzer, 1999). Implementation intentions define when, where, and how one will act on one's goals. Implementation intentions have the structure of "If situation X is encountered, then I will perform the goal-directed response Y," thereby spelling out how the goal will be realized once a relevant situational cue is encountered.

In recent years, the strategy of mental contrasting (MC) has been combined with implementation intentions (II) in one intervention exercise: Mental Contrasting with Implementation Intentions (MCII). Research has indicated that MCII improves people's daily lives and long-term development by helping them achieve their behavior change goals (Oettingen, 2012; Oettingen & Gollwitzer, 2010). Moreover, MCII has been found to produce immediate and lasting behavior change (Stadler, Oettingen, & Gollwitzer 2009; 2010). MCII also produced greater goal achievement than did mental contrasting or implementation intention strategies employed alone (Stadler, Oettingen, & Gollwitzer 2009).

Traditional intervention studies focus on changing participants' beliefs about the desirability and feasibility of their behavior as well as on changing how they understand their goals and their current situation. MCII differs by focusing on pursuing desired outcomes in wise, effective, and efficient ways. MCII can be learned and applied to a single targeted outcome (e.g., losing five pounds), but it can also be applied to a variety of concerns a person may have during everyday life. Finally, MCII can be taught and applied in time and cost-effective ways. In addition to these established strategies, the use of visualizations of goal progress has also been shown to increase motivation to achieve goals (Cheema & Bagchi, 2011).

Each of these goal pursuit strategies was included in the current research and examined as they pertain to improving goal achievement through the use of a mobile goal planning and pursuit application. Mobile technologies are of interest to the Army given their portability and suitability to address training needs when and where they arise (TRADOC, 2011).

Method

Two mobile applications were developed to compare SMART and MCII goal planning and pursuit approaches. The following describes the process of developing the applications and presents their key features. In addition, the evaluation process for comparing the two applications is presented and discussed.

Application Specifications

Based on discussions with academics and Noncommissioned Officer Educational System (NCOES) instructors, the research team gathered recommendations for the best processes, steps and content to implement the SMART and MCII techniques within a smart phone application for Soldiers. These discussions included consideration of the wording, time spent, input requirements, Soldier thought processes and overall objectives related to emphasizing the techniques and the utility of the techniques for Soldiers involved in specific goal planning and pursuit activities. These specifications were documented and provided to the development team. These documents allowed for ongoing discussions between the development and research team to make improvements to the pages, functions, and layouts prior to initial development. The applications were developed to function equivalently in both iPhone and Android versions.

Application Development Process

The application development process for both applications included:

1. Discussions with project team members regarding the optimal number of screens (pages), screen content detail, input requirements and the look of the applications to optimize Soldier interest, engagement and value of using the applications.

2. Developing application content. Various content strategies were proposed for each of the screens for each application. Proposed content was reviewed by the project team multiple times to streamline what was presented on each screen and the input requirements of the participants. A central theme in developing content was to make the language simple and straightforward and to limit the goal input requirements so that only a minimum number of goals would need to be set. This approach was intended to keep the use requirements straightforward and not too time-consuming for the user. Attempts were also made to develop the Army Achieve and SMART applications to equalize the time and effort required to complete each application.

3. Developing two layout options, representing different color schemes and icons. These layouts were presented to Army Research Institute (ARI) for review. Various logos for both SMART and Army Achieve applications were considered. Ultimately, we sought to give the design an Army flavor without making it appear that the Army was formally endorsing the applications. These logos appear in the screen captures in Figures 1-24.

4. Developing representations of each page in the Army Achieve (MCII Application) and the Army SMART (Army goal book based application) as they would appear on a smartphone. The code for both applications was written using Appcelerator/Titanium[2], a cross platform development solution that uses Java Script.

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[2] http://www.appcelerator.com

5. Discussions and contingency planning around additional functionality (e.g., programmable reminders, random reminders on goal progress), limitations (e.g., what would happen if the application were open and incoming phone calls were received), and downloading and running the applications on different phones and smartphone types and applications (e.g., Android, iOS).

Army Achieve Application

As the purpose of the Army Achieve application was to focus on the MCII principles, the input requirements simple and short, limiting goal and other text entries to 60 characters.[3] Android and iPhone versions of the application screen had some minor differences, primarily due to screen size and menu locations. Screen captures from the Android version of the application are provided in Appendix A. Table 1 describes the structure and content of the Army Achieve application.

Table 1.
The Structure and Content of the Army Achieve Application

Screen Identifier	Purpose/Function	Data Entered by Participant
1. Home Screen	Introduce the application	Participants entered profile information on first use; then used screen to add goals.
2. Profile Information	Track user data	Course; Rank; Field/MOS; Time in Service
3. Identify End of Course and 24-Hour Goals	Have user establish a near term and long term goal	Text input describing goals
4. Identify Your Outcome	Have user identify the outcomes associated with their goals.	Text input describing outcome
5. Imagine the Outcome	Have user picture themselves achieving the outcome in order to prepare them for mental contrasting	No data entered
6. Identify Your Obstacle	Have user anticipate what could interfere with their pursuit of their goals	Text input describing obstacle; focus was on an internal rather than external obstacle
7. Imagine this Obstacle	Have user imagine obstacle as part of the mental contrasting process	No data entered
8. Taking Action	Have user describe an action they can take to overcome the obstacle	Text input describing action
9. Creating an *If…Then…Plan*	Have users clearly state what they will do if they encounter the obstacle; motivate goal pursuit process	Text input describing plan; repeat entry of text to better instill the plan in memory
10. Goal Summary Screen	Provides users with a summary of the information they entered	Prompts users to 'save' the data they entered
11. Goal Progress Screen	Allows users to track their progress for each goal they entered	User indicates a 'percentage completed' in their progress toward their goal
12. Evaluation of Application	Allows users to provide feedback on the application	Users answer a set of Likert style and open-ended questions concerning their experience using the application

On completing the application, users were presented with a screen that allowed them to provide feedback on their experiences using the application. The evaluation items, presented in

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[3] These design characteristics were recommended by G. Oettingen and P. Gollwitzer (personal communication, March-April 2013).
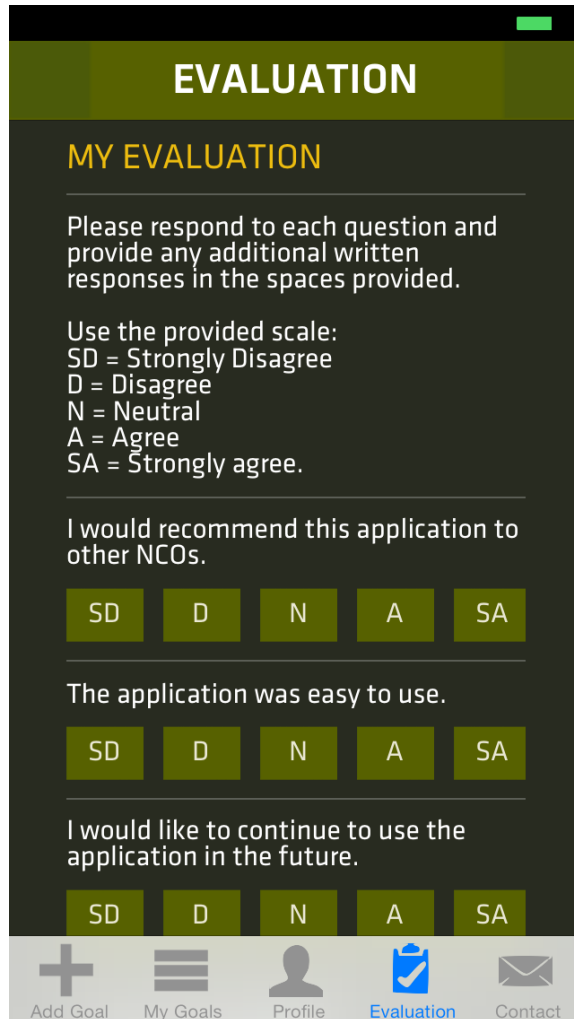
Table 2 below, included nine items to be rated using a Likert-type agreement scale and three open-ended questions. Items 1-3 were analyzed as a composite scale associated with the "Utility of the Application," items 4-6 were associated with "Goal Approach" and items 7-9 were associated with "Motivation." Open ended responses were also analyzed for common themes.

Table 2
Evaluation Items and Scales

Item	Scale
1. I would recommend this application to other NCOs.	5-point agreement scale (Strongly Agree (SA), Agree (A), Neither Agree nor Disagree (N), Disagree (D), Strongly Disagree (SD)
2. The application was easy to use.	5-point agreement scale
3. I would like to continue to use the application in the future.	5-point agreement scale
4. The application changed my way of approaching challenges.	5-point agreement scale
5. The application helped me more clearly identify my course goals.	5-point agreement scale
6. The application helped prioritize my learning tasks.	5-point agreement scale
7. The application helped me learn more in this course.	5-point agreement scale
8. The application helped me be more involved in this course.	5-point agreement scale
9. The application helped me stay motivated to pursue my goals.	5-point agreement scale
10. The best thing about the application is:	Open-ended response
11. Something that could be improved about the application is:	Open-ended response
12. Other comments:	Open-ended response

A partial depiction of the evaluation screen in the Army Achieve application appears as Figure 1.

Figure 1. Partial Depiction of Army Achieve Evaluation Screen.

After completing all items in the evaluation, the user could then click on the "Send" button at the bottom of the evaluation and an email message would be opened with the Army Evaluation Team address populated in the send line. Users could then send the email directly from any email return address they wished to use.

There was also a means by which users could contact the Evaluation Team with any problems or questions they had regarding the use of the application or completing the evaluation. A contact menu button took users to an open email message, prepopulated with the Evaluation Team email address. The users could type in any message and send the message from their chosen email address.

Army SMART Application

The purpose of the Army SMART application was to focus a goal setting and pursuit process that reflected the current Army Resiliency program goal setting process. This process, based upon the Army Goals Book (Department of the Army, Army Center for Enhanced Performance, n.d.), was considerably more complex than the process developed for the Army Achieve application and was therefore modified somewhat to provide a comparable application for evaluation purposes. This section describes the process and screens developed in the Army SMART application. Android and iPhone versions of the application screen had some slight differences, primarily due to screen size and menu locations. Android versions of the screen captures for each screen are provided in this section. The various screens are presented in Appendix B. Table 3 summarizes the structure and content of the Army SMART application.

Table 3

The Structure and Content of the Army SMART Application

Screen Identifier	Purpose/Function	Data Entered by Participant
1. Home Screen	Introduce the application	Participants entered profile information on first use; then used screen to add goals.
2. Profile Information	To track user data	Drop down menus to for participants to enter data on their Course, Rank, MOS, etc.
3. Add Goal	Identify a long-term goal	Text data; users allowed 120 characters as opposed to the 60 characters in Army Achieve app
4. Strengths	Identify key strengths, skills, and qualities to help users reach their goals; users also prompted to enter key obstacles and challenges to reaching their goal	Text data (120 characters)
5. Priority	Identify something about themselves to work on to help them achieve their goal	Text data (120 characters)
6. Action/Belief	Identify a key action that is specific, measurable, attainable, realistic, and time-bound; in addition, users were asked to enter a motivating belief	Text data (120 characters)
7. Short Term Goals	Identify a 24-hour and 7-day goal associated with outcome goal	Text data (120 characters)
8. Mindful	Identify what users should do to remain mindful of their goals	Text data (120 characters)
9. Goal Summary	Summarizes users' entries, allows them to save their goals	Users save their completed goals after review
10. Goal Progress Screen	Allows users to track their progress for each goal they entered	User indicates a 'percentage completed' in their progress toward their goal
11. Evaluation of Application	Allows users to provide feedback on the application	Users answer a set of Likert style and open-ended questions concerning their experience using the application

The evaluation portion of the application was identical to the Army Achieve application in that users could access the My Goals screen to indicate progress on goals, and access the Evaluation screen to complete the application evaluation and email their results to the Research Team. In addition, users could contact the research team through the Contact screen.

Application Fielding and Testing

Following approval of wireframe content, the functional prototypes of the Army Achieve application in iOS and Android versions were developed. These versions were distributed to team members and ARI through TestFlight.[4] TestFlight is a developer's tool which allows licensed users to download test applications not available to the general public. Due to differences in screen and layout options on iPhone and Android systems, multiple versions of the applications were necessary to properly represent application content across the Profile, Goal Planning, Goal Progress Tracking and Application Evaluation functions. Final applications were distributed to participants through the iTunes ICF and Android ICF stores to limit the awareness of the general public as to the availability of the applications.

Evaluation of the Mobile Applications

Participants. Participants in the Army Achieve and SMART application evaluation included students in three NCO professional development courses held at Fort Leonard Wood, MO. Students from the Advanced Leader Courses (ALC) in Chemical, Biological, Radiological, and Nuclear (CBRN), Military Police (MP), and Engineering (ENG) participated. A total of 116 NCOs each attended one of six sessions. A total of 113 participants were eligible, on the basis of the operating system of their phones, and agreed to participate in the research. The exact breakdown of iPhone to Android users could not be determined as not all information on the sign-in sheets was completed by all participants. However, for those individuals who did indicate their phone's operating system, 31 out of 66 had iPhones and the remainder had Androids. The three who could not participate were using Windows-based phones or older flip-phones.

Materials. The Army Achieve application contained an internal database that tracked:

- Goal description entered, time and date of entry,
- Type of goal entered (24-hour, End of Course, Other),
- Outcome the student associated with the goal,
- Obstacle the student associated with achieving the goal,
- Action the student identified with overcoming the obstacle,
- If…Then…Plan the student created to help overcome obstacle, and
- Progress indicated on the goal.

The Army SMART application contained an internal database that tracked:

- Long term goal description entered, time and date of entry,

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[4] The testflight application software can be downloaded at https://testflightapp.com/

- Strength, skill or other quality identified to help reach goal,
- Obstacle or challenge the student associated with achieving the goal,
- Priority identified for self-development,
- Key action identified,
- Key belief identified,
- Short term goals identified to reach long term goal,
- Description of what the student will do to be mindful of the goal, and
- Progress achieved on the long term and short term goals.

A student evaluation of the application was also self-contained in the application. The evaluation was identical for both Army Achieve and Army SMART applications. Students were instructed to fill out the evaluation no earlier than two days before the end of the course. After students completed the evaluation, they could e-mail the evaluation directly to the study team.

Procedure. Students were introduced to the application during a 20-45 minute orientation session that occurred at different points in each course. An attempt was made to schedule this orientation for the second week of each course, but ultimately the orientation occurred between the 2nd week and next to last week of each course. During this orientation, the following topics were presented:

- Privacy Act and Informed Consent
- Objective of using the application
- Application Installation
- Instructions for providing Profile information, using the application and providing an evaluation of the application, and
- Additional information regarding the evaluation and timeframe for response.

The orientation was conducted in a room with open access wireless capability. Participants were provided access to download the applications. They were aware that there were two goal pursuit strategies being tested with the applications. Each of the six orientation sessions focused on either the SMART or MCII applications. That said, the participants were offered the opportunity to download the other, either SMART or MCII, application on request after completing the research.

Follow Up. Due to a low response rate, participants who had signed up for the evaluation were sent two email reminders regarding completing the application and sending the results to the research team. The first reminder was sent at the end of the final week of class for the ALC course that was the last to finish. The second reminder was sent the following week. Only one additional evaluation was returned in response to these reminders.

Analysis Strategy. The intent of the evaluation was to conduct primary analyses concentrating on descriptive statistics, t-tests and analysis of variance related to the number of goals entered, progress indicators related to those goals and to compare the student evaluations of both goal planning applications across the individual evaluation items and composites.

Results

A total of nine participants returned their evaluations using the built-in email evaluation function. Five of the evaluations were submitted within three days of the orientation session, which was well in advance of the request to submit the evaluation just prior to or just after the end of their course. The summary evaluation results, expressed as mean scores on each evaluation item for the Achieve and SMART application respondents, appear in Table 4.

Table 4

Responses to User Evaluation for Army Achieve and Army SMART Applications

Item	Achieve Mean (N=4)	SMART Mean (N=5)
I would recommend this application to other NCOs	3.25	3.60
The application was easy to use	4.75	4.20
I would like to continue to use the application in the future	3.50	3.40
The application changed my way of approaching challenges	2.75	3.20
The application helped me more clearly identify my course goals	3.75	3.40
The application helped prioritize my learning tasks	3.25	3.40
The application helped me learn more in this course	2.75	3.20
The application helped me be more involved in this course.	3.25	3.20
The application helped me stay motivated to pursue my goals	3.75	3.40
Total	**3.44**	**3.44**

Note: Standard Likert scale response categories were used for these items: 1 (Strongly Disagree), 2 (Disagree), 3 (Neither Agree or Disagree), 4 (Agree), and 5 (Strongly Agree).

Additional open-ended comments were solicited in regard to each application. No firm conclusions could be drawn from the comments provided. The Army Achieve application was associated with slightly more comments overall than the Army SMART application.

Army Achieve Comments

Participants described the application as easy to use and helpful to keep them on track with their goals. One participant noted that the application was good, but the concept was flawed. Another noted the process involved too much redundancy. Finally, one participant commented that the application "could use more flare."

Army SMART Comments

There were very few comments for the Army SMART application. One participant noted that the application was easy to use, and another that it could have been more colorful.

Goals Entered into the Applications

The goals entered in the Army Achieve application tended not to be in-depth, e.g., "make Commandant's list," and "graduate with an 88% or higher." The Army SMART goals tended to be more in-depth, e.g., "I would like to make commandants list. Possibly be honor grad, help distinguish myself from my peers," "I want to earn commandant and learn more about what it takes to be a leader." The length of the responses may have been related to the respective character lengths allowed in each application: 60 characters for Army Achieve and 120 characters for Army SMART. Three Army Achieve and four SMART application users returned their evaluations with goal data included.

Based upon the extremely low response rate (8%), no statistical tests were conducted. The recommendations section of this report will therefore concentrate on the limited findings from the returned evaluations and participant comments during the larger, more representative orientation sessions.

<div align="center">

Discussion

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The mobile applications were designed to provide Soldiers with templates to guide their goal planning and pursuit processes; the associated research was focused on comparing two goal planning and pursuit processes. While goal planning and pursuit techniques are supported by and included in Army doctrine (e.g., the Military Decision Making Process, and SMART goals approach), it is unknown how frequently structured goal setting techniques are employed by Soldiers. Previous research has suggested, however, that a variety of techniques related to goal planning and pursuit are employed by Army NCOs in the context of self-directed learning (Graves, Rauchfuss, & Wisecarver, 2011).

Structured goal planning and pursuit can be a valuable activity, but its value may depend on individual Soldiers' experience level, the context of the goals being pursued, and the motivation of individual Soldiers to use the techniques. Moreover, certain types of goals warrant an in-depth planning process, whereas others do not. For individuals who are used to a more informal, open-ended goal planning and pursuit process, the structured approach may not have been viewed as flexible or adaptable enough to meet their needs. Unfortunately, the low response rate did not allow us to determine whether or not NCOs had a preference for either of the goal planning and pursuit techniques. Although the experiment comparing the two approaches to goal planning and pursuit was unsuccessful due to a low response rate, there were a number of takeaway points concerning the difficulties that may be encountered developing and deploying digital applications that we were able to derive from our discussions with participants in the orientation sessions.

Selection of the Modality for the Training

The goal planning and pursuit subject content did not lend itself to the limited visual format of mobile phones. With a limited amount of space and small font size, users of the applications may have been challenged to enter their goals and to respond to the various questions asked by the application when walking them through the goal planning process.

Limiting the number of characters to keep all the text on screen, and to conform to the requirements of the goal planning and pursuit techniques being evaluated, likely did not help reduce cognitive load associated with the task. Participants were forced to be as concise as possible in responding to the on-screen questions. That said, this point could be made concerning other types of applications the Army may seek to develop for mobile devices. While mobile devices have the advantage of almost always being with Soldiers, the devices are necessarily limited as training technologies by their physical size and storage capacity. The size and capacity of the device used for training should always be considered in the content selection and design phases of application development (Blankenbeckler, Graves, & Wampler, 2013).

Individual Cost/Benefit Determinations

While the applications were made available to participants for free, the participants were nonetheless being asked to run these applications on their personally-owned mobile phones. As storage space is limited on these devices, users may regularly cull the applications on their phones. If an application remains largely unused, it may be deleted. While participants recognized the need for establishing good goal planning and pursuit processes, our applications may not have been viewed as facilitating their approach to that process. This was suggested in some participants' comments during the orientation sessions that "the concept is good, but the execution was flawed." If the applications were not perceived to streamline the process of goal planning and pursuit, then participants would not have been motivated to retain them on their personal mobile phones for the duration of the evaluation period.

Delivery and Accessibility

Another issue involving the use of participants' personally-owned mobile phones concerned minimizing costs to them as much as possible. In order to avoid asking participants to download the mobile applications against their own data plans, we utilized the wireless network at the Fort Leonard Wood NCOA. This required a classroom in which a wireless local area network could provide a clear signal that users could access, and additional coordination with the local information technology specialists to grant the required access. The wireless network at Fort Leonard Wood had sufficient bandwidth and signal strength such that the participants did not need to use their own accounts for downloading. Participants were able to download the applications in real time during the training sessions. In order for an experiment of this type to be successful, the infrastructure to distribute applications digitally must be in place. If the researcher is providing the devices to participants, rather than asking them to volunteer to use their personal devices, the devices could be preloaded with the necessary software. This, however, would have been a cost prohibitive option to pursue in order to test simple goal planning and pursuit techniques.

The Population Selected for the Evaluation

Mid-level Army NCOs may not have been the ideal population from which to draw a sample for the evaluation. At this point in their careers, many of these NCOs have likely developed preferred approaches to goal planning and pursuit, having had a number of jobs within the Army and a more extensive military and civilian educational background (see Graves,

Rauchfuss, & Wisecarver, 2011). An alternative audience who may benefit from exploring different goal planning and pursuit processes could be early-career Sergeants (E-5), Specialists/Corporals (E-4), and below.

Need for Integration with Existing Army Systems

In one orientation session, an NCO said "no one will use the application" as it does not immediately appear to add value for the Soldier. He felt there would be value added by integrating the applications with the existing Army Career Tracker. In their current state, the applications were viewed as being too simplistic to be compelling. While there was some agreement in the room with respect to these comments, the researchers responded by indicating that the evaluation was to determine the potential value of the applications and to compare the respective approaches to goal planning and pursuit. Later integration of the applications with larger Army systems could be possible.

Other Potential Reasons for Low Response Rates

Participants were made aware that their participation was voluntary and they were not under any obligation to use the application or to return the evaluation. Throughout the orientation sessions, the research team acknowledged that participant time was limited, appreciated, and integral to the success of evaluating the mobile applications. Participants may have simply chosen not to use the applications because they did not perceive value or a need to provide feedback. During the orientation sessions, we sought to incentivize participation by providing the participants with a free mobile application that they could keep if they found it useful. We also gave them the option of downloading the alternate version of the application after the evaluation period.

Too much time may have elapsed between the initial sessions and the user evaluation. While participants were sent reminders to solicit their user evaluations, this resulted in very few additional responses. Likely, at the end of the course and close of the evaluation period, the NCOs were focused on returning to their units and homes.

Recommendations

Recommendations for improving the evaluation of mobile applications in Soldier samples are:

1. Attempt to conduct evaluations completely onsite, with Soldiers present in the evaluation conditions. Though this is a challenging solution for any application that has value over a time period beyond the "test" condition, it seemingly is the best means to ensure completion rates when testing mobile applications. Unfortunately, for the present research, the effectiveness of goal planning and pursuit strategies are unlikely to be able to be tested over a session-length time period (1 to 2 hours) using mobile applications. Attrition can become an issue in any longitudinal data collection (Ahern & Le Brocque, 2005); for this type of evaluation we recommend attempting to collect as much data as

possible in single face-to-face sessions to ensure a reasonable sample size and improve generalizability.

2. Perform pilot tests of the application on groups that are similar in characteristics and context to those groups targeted for the evaluation. For the present study, time did not permit for a pilot test of the applications to determine possible return rates in a larger sample, or potential causes of attrition.

Participants in the mobile application goal setting orientation sessions provided several comments related to desirable improvements to the applications prior to their actually using the application and completing their evaluations. These were related to:

1. Linking the application to existing Army planning and scheduling systems, particularly Army Career Tracker.

2. Providing reminders or scheduling function that might prompt the user regarding subgoal steps or progress (i.e., integrating the application with the users' calendar).

The development team did not consider integrating the applications with any external Army systems, but rather sought to specifically evaluate to two goal planning and pursuit techniques in isolation from any existing systems. One major concern was participants' privacy, so we limited the integration of the experimental applications with personalized features of participants' phones, such as calendars, address books, etc. The development team did consider providing reminders or a scheduling function but decided against this. Input from MCII subject matter experts did not recommend application reminders as these would impose more rigor or structure than is necessary. From the MCII perspective, the strength of the technique is its simplicity of goal and obstacle imagery and the imprinting of the If…Then…Plan. Providing a schedule or reminders was not recommended as it could increase complexity and create obstacles to goal pursuit.

Conclusions

While goal planning and pursuit techniques are significant to the Army, a clean evaluation of the two goal planning and pursuit processes was not possible due to attrition among the participants during the evaluation period. On the basis of the few responses received, no differences were indicated between the two goal planning and pursuit techniques. Recommendations for future research using mobile applications include exploring the possibility of better integrating the application with existing Army systems and to focus the evaluation on single session, face-to-face data collections.

As the U.S. Army continues to focus on developing Soldiers' cognitive skills and enhancing their learning capabilities, training and job aids to support adaptability, decision-making in complex situations, etc., will be in demand (Department of the Army, Maneuver Center of Excellence, 2012). Mobile devices are an obvious technology for distributing and utilizing training and tools focused on cognitive skills development: these devices are in widespread use, are highly portable, and can access large amounts of data through wireless

networks. However, these devices also have their limitations, including the physical dimensions of their screens, their cost, and the significant need to protect participants' privacy, particularly when asking participants to volunteer to use their personally owned devices. Any application of mobile technology will elicit key questions concerning how to optimize the design of training and tools for mobile devices as well as how to appropriately integrate these technologies with existing Army systems, while maintaining vigilance regarding the Army's information security requirements and protecting Soldiers' private information (Department of the Army, Training and Doctrine Command, 2015).

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APPENDIX A

Screen Shots and Descriptions for the Army Achieve Application

Appendix A: Army Achieve Application

As the purpose of the Army Achieve application was to focus on the MCII principles, Professors Oettingen and Gollwitzer (personal communication, March-April 2013) provided extensive input concerning the content of the application. They stressed keeping the input requirements simple and short, limiting goal and other text entries to 60 characters in length. The following sections describe the final content included in the Army Achieve application. Android and iPhone versions of the application screen had some minor differences, primarily due to screen size and menu locations. Android versions of the screen captures for each screen are provided in this section.

Home Screen

This screen provided a short introduction to the application to encourage participants to use the application. The only navigation instructions from this screen were to Add Goal, however, menu buttons related to My Goals, Profile, Evaluation and Contact were also visible. Upon clicking on any of the navigation buttons, a pop up window appeared that stated "Please enter your information on the Profile tab before adding a goal" and the user was taken to the Profile screen to complete Profile information upon selecting the "ok" button. The content for the home screen is presented as Figure A-1.

Figure A-1. Army Achieve Home Screen.

Profile Information

A profile page was created to track evaluation participant data (Figure A-2). It consisted of drop down menus and text entry fields to make data entry as user-friendly as possible.

Figure A-2. Army Achieve Profile Screen.

This page could be accessed at any time to update information as desired by the user. The following fields and user entry methods were included:

- Course (drop down menu with options for Basic Leader Course, Advanced Leader Course, Senior Leader Course),
- Rank (drop down menu with options for SPC/CPL, SGT, SSG, SFC),
- Field/MOS (free form text entry), and
- Time in Service (free form entry into Years and Months fields).

For free form entry fields on this and all subsequent pages requiring free form text entry, clicking in the free form field opened the user's keyboard to enter text. The smartphone's standard data editing and entry capabilities were enabled for text entry.

After entering all information and clicking on the return keyboard button, a pop up "Save" button appeared. After clicking on Save, the user was then returned to the home page

and the "+Add Goal" button opened a pop up window stating "To begin using this application, you must: 1. Set an End of Course Goal. 2. Set a 24-hour goal. You can then set any additional goals for any time period." The user then clicked on a continue button to advance to the Identify Your Goal screen (Figure A-3). For this and subsequent screens requiring user input, a "Continue" button appeared at the bottom of each page following data entry.
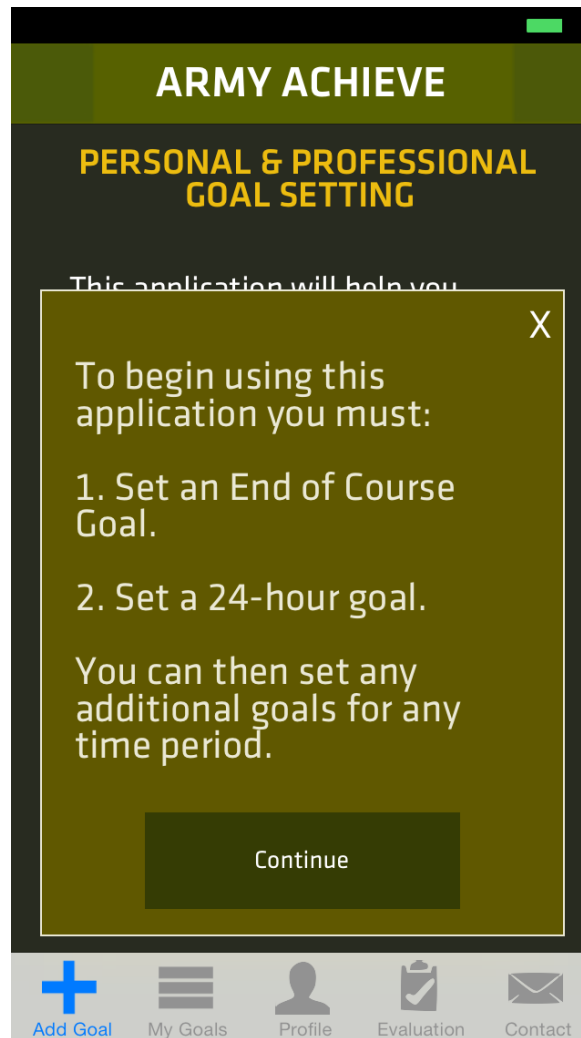
Figure A-3. Advancing to the Identify Your Goal screen in the Army Achieve app.

Add Goal/Identify Your Goal

After advancing to the Add Goal/Identify Your Goal screen, users were instructed to "First, identify your most important end of course goal. This goal should be challenging, but achievable." A drop down menu appeared, but only the End of Course goal could be selected the first time the user encounters this screen. A text entry field indicating "Goal (60 characters or less)" appeared in which the participants could add a short description of their End of Course goal. There were no restrictions placed on what text could be entered into the field. Spell check

may have been active, depending upon the smartphone being used by the participants. In addition, some phones would also allow for the participant to select the microphone option and speak their entry which would then be translated to text by their phones speech to text translation application. Figure A-4 depicts to the Add Goal/Identify Your Goal screen for the Army Achieve application.

Figure A-4. Army Achieve Add Goal/Identify Your Goal Screen.

Identify Your Outcome

The Identify Your Outcome screen asked the participant "What is the best outcome you associate with achieving your goal?" This information was deemed important to allow the participant to begin imagining how the goal differed from their current situation in order to build value for the participant. The user was again provided with a 60-character free form entry field to identify their outcome. Figure A-5 provides a depiction of the Outcome screen.
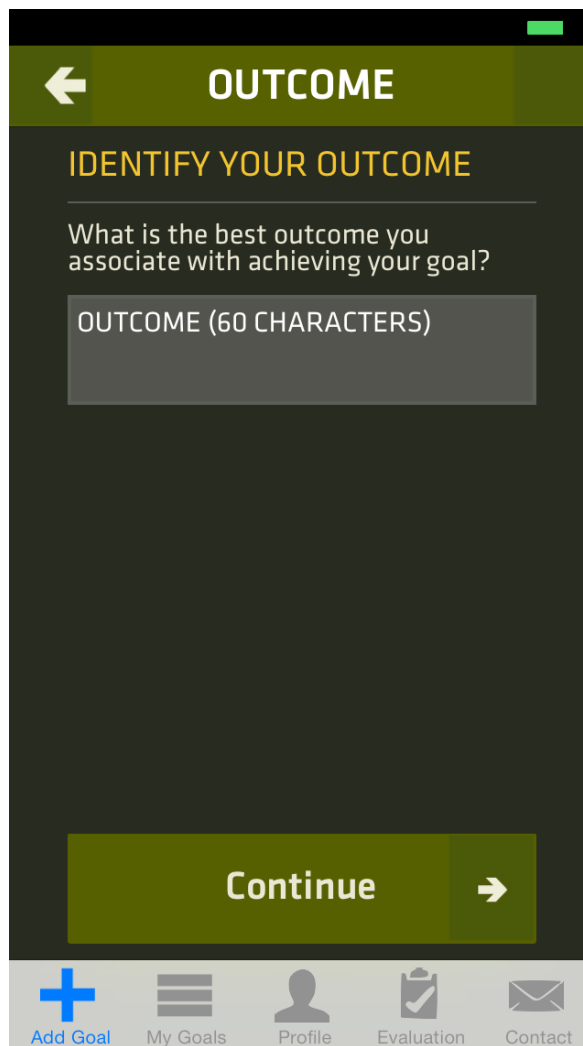
Figure A-5. Army Achieve Identify Your Outcome Screen.

Clicking on the "Continue" button opened a pop-up window that read:

> Take a minute or two to imagine this outcome. [The outcome the NCO entered is displayed.] Picture yourself achieving this outcome. After you have a clear image in your mind, touch Continue.

The purpose of this exercise was to assist the participant in mental contrasting to reinforce the importance of the goal as well as what it will be like to achieve it. This popup appears as Figure A-6.
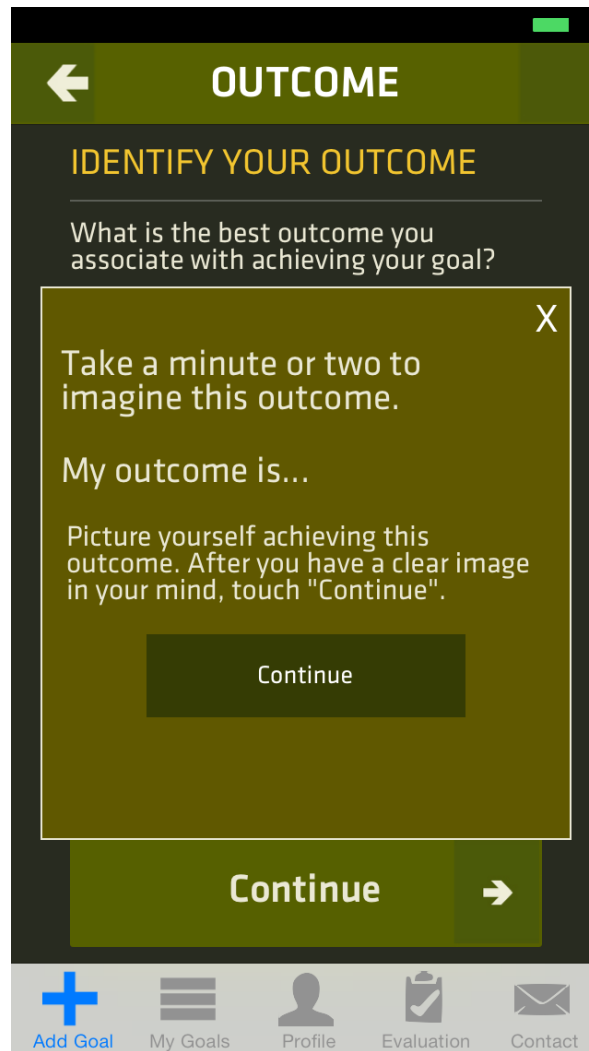
Figure A-6. Popup Screen Following Input of Participant Identified Outcome of Achieving Goal.

Identify Your Obstacle

After imagining the outcome and clicking the continue button, users were then instructed to identify the main obstacle to achieving their goal. This screen instructed users to "Identify your obstacle: What stands in the way of reaching your goal? (What is it within you that may prevent you from reaching your goal?)" To provide proper motivation for overcoming the obstacle, it was important that the obstacle was expressed as something within the participant versus external to them. Again, a 60-character free entry field was provided to identify the obstacle (See Figure A-7).
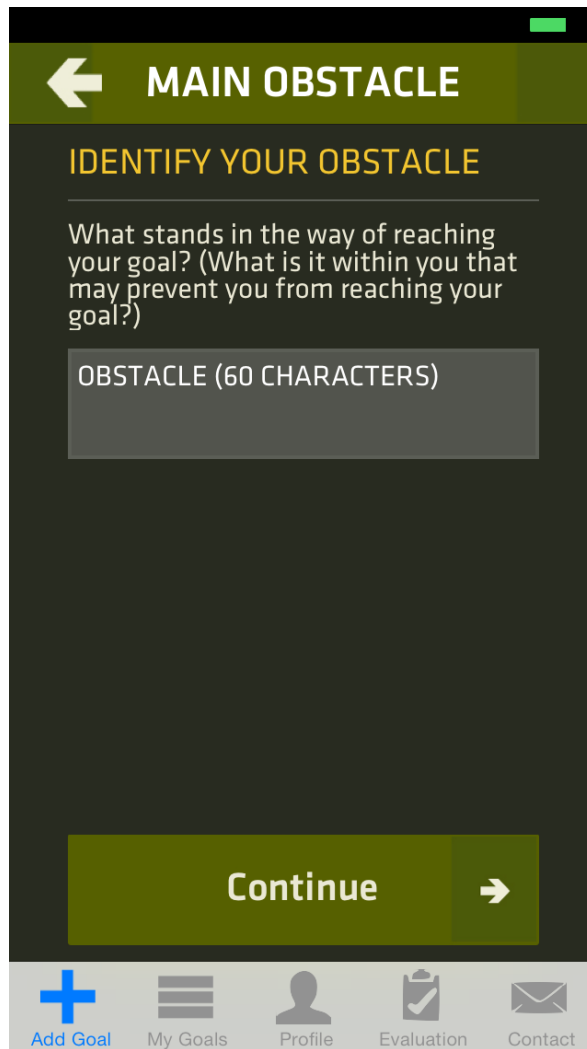
Figure A-7. Army Achieve Identify Your Obstacle Screen.

After clicking on the continue button, another popup window appeared that stated "Take a minute or two to imagine this obstacle." Users were again encouraged to imagine their identified obstacle as part of the mental contrasting portion of the process. This screen appears as Figure A-8.
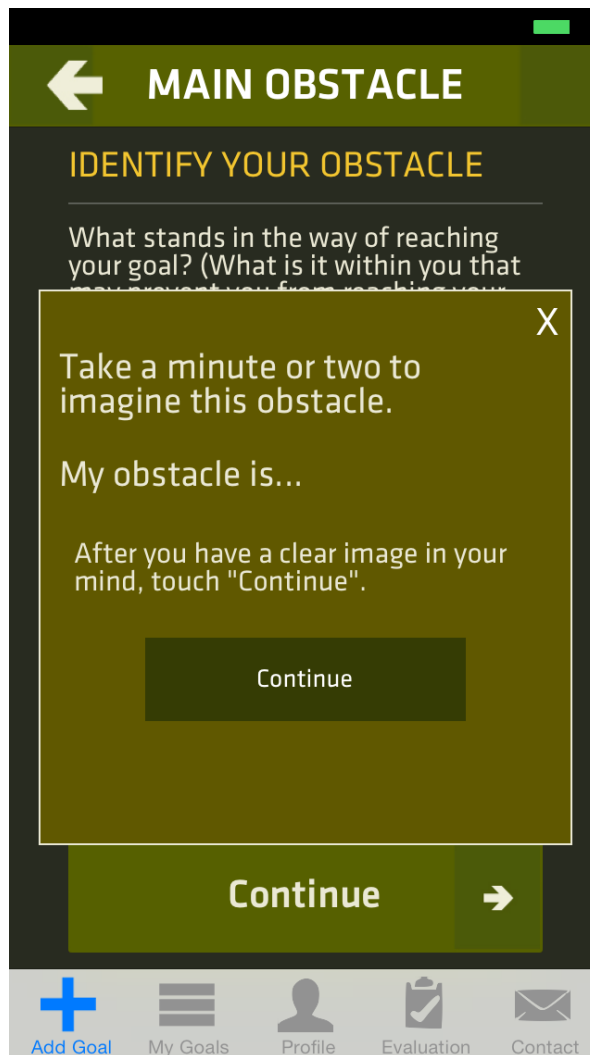
Figure A-8. Army Achieve Imagining Obstacle Screen.

Taking Action

After users again imagined their main obstacle, they were asked to identify an Action to overcome the obstacle. Figure A-9 depicts the Taking Action screen. Once again, users were provided with a free form, 60-character text entry field for identifying this action. Unlike the previous two pages, there was no 'imagining' popup window that appeared when they completed this page.
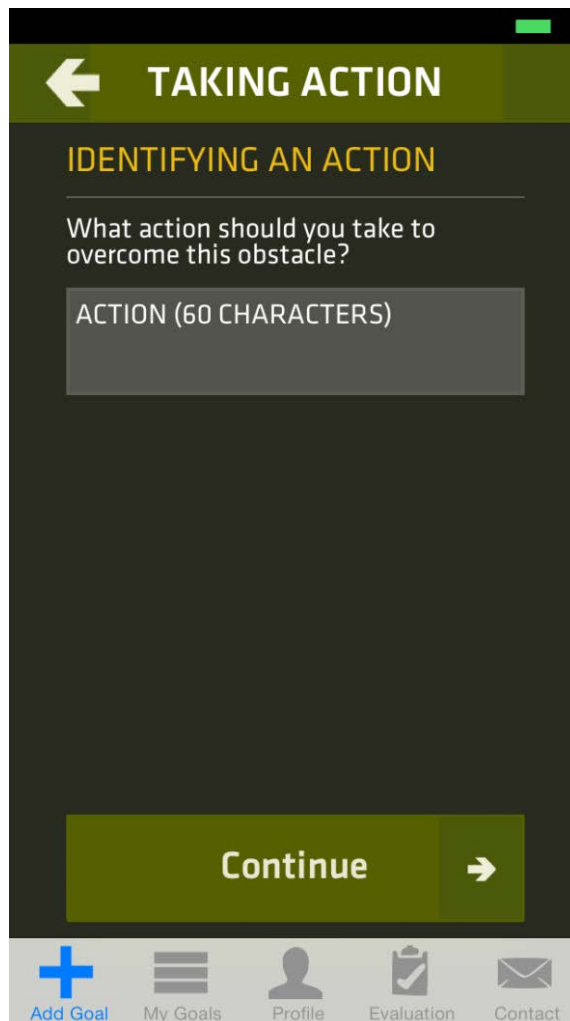
Figure A-9. Army Achieve Taking Action Screen.

Creating an If…Then…Plan

Once users had identified an action to overcome the obstacle, they were asked to "make a simple If…Then… Plan by filling in your obstacle and the action you will take to overcome that obstacle in fields below." The user was prompted to re-enter the information related to the obstacle and the action to take as depicted in Figure A-10. While this screen is essentially a combination of the two previous screen functions, it is important in the implementation intentions process in that it links the obstacle to the action identified to overcome that obstacle. It then requires the user to repeat this plan a second time. This If…Then…Plan is critical in maintaining motivation to pursue goals and especially to be better prepared to overcome obstacles on the journey to goal achievement. While the application could have "prepopulated" the If…Then…Plan with the entries from the Identify Obstacle and Taking Action pages, it was deemed important that the user re-enter this information to help them better recall and implement their plan. Another key aspect of this process was to use the phrase "then I will" with respect to

what action will be taken. This phrasing was felt to encourage users by explicitly stating what they will do to overcome the obstacle.
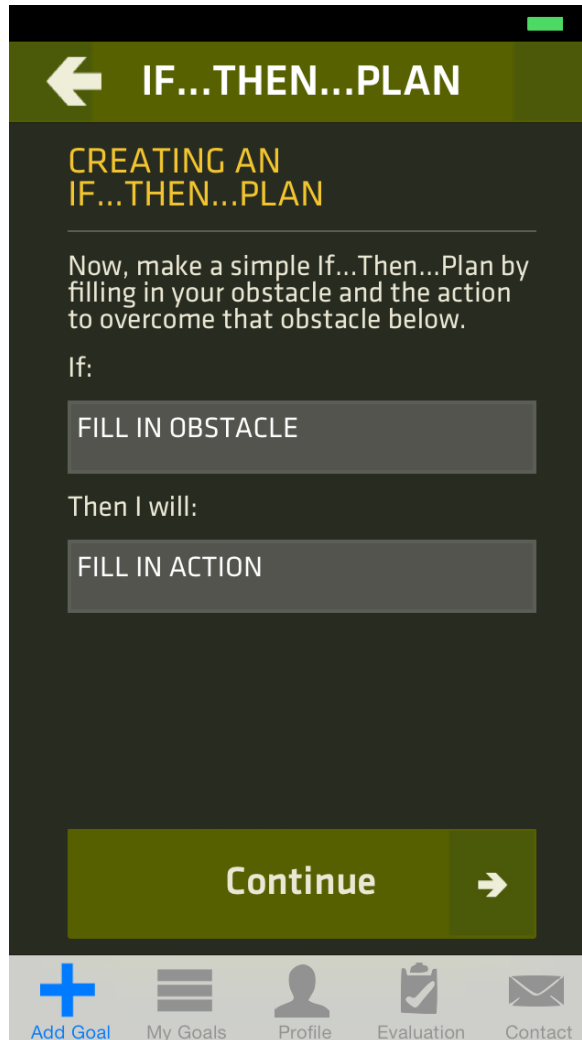
Figure A-10. Army Achieve If…Then…Plan Screen.

Following the initial entry of the If…. Then…Plan information, the user was prompted to repeat the process to re-enter the obstacle and action a second time. This repetition of the link between the obstacle and the action begins building memory for the plan. A screen capture depiction of the repeating of the If ... Then ... Plan appears in Figure A-11.
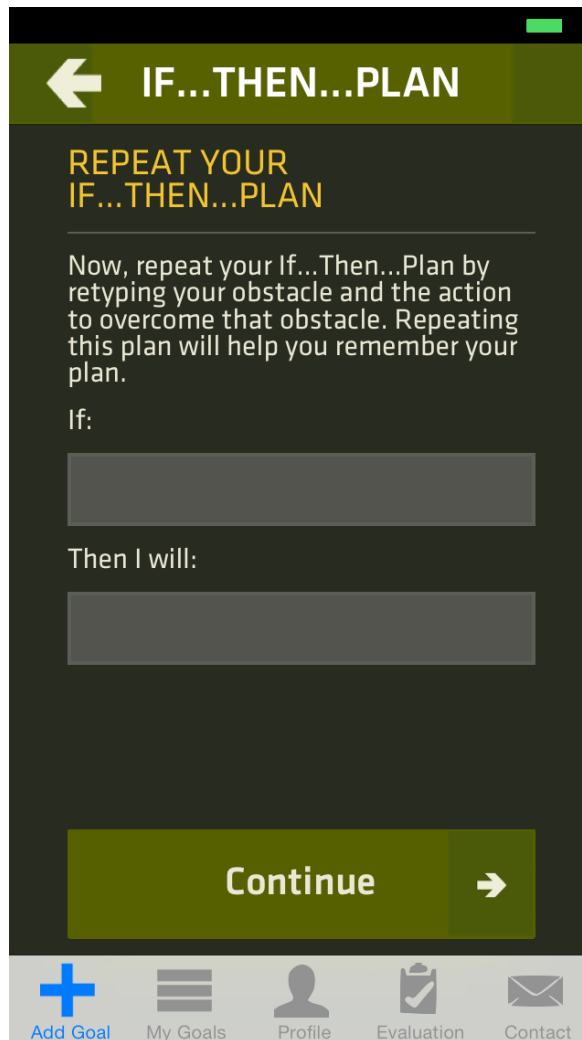
Figure A-11. Army Achieve Repeating of the If…Then…Plan Screen.

Following the entry of the If…Then…Plan and the repeating of the Plan, the user was again prompted with a popup window which stated "Take a few moments to imagine your If…Then…Plan." The application populated the obstacle and action taken information from the previous If…Then…Plan screen. After users have imagined the Plan, they would then click continue. The imagining portion of the If…Then…Plan screen is depicted in Figure A-12.
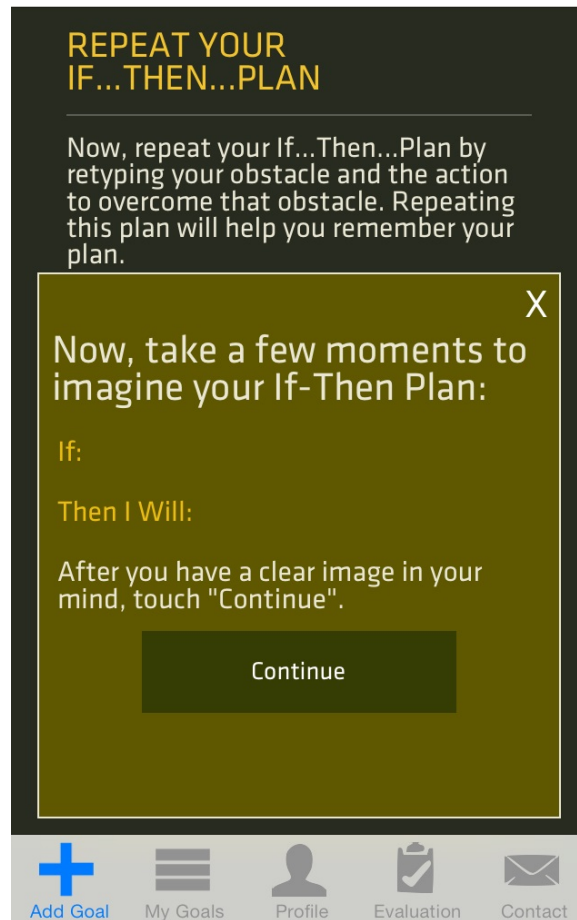
Figure A-12. Depiction of If…Then…Plan Imagining Instruction of the Army Achieve Application.

Goal Summary Screen

After the users clicked on the Continue after they imagine the If…Then…Plan, the user was taken to the Summary screen. The Summary screen provided all information entered by the user related to the previous screens, and consisted of the information as depicted in Figure A-13. The purpose of the Summary page was to provide a review of the information previously entered. There was no edit function built into the Summary page. The "Save" button took the user to the My Goals page and allowed the user to track their progress on the goal.
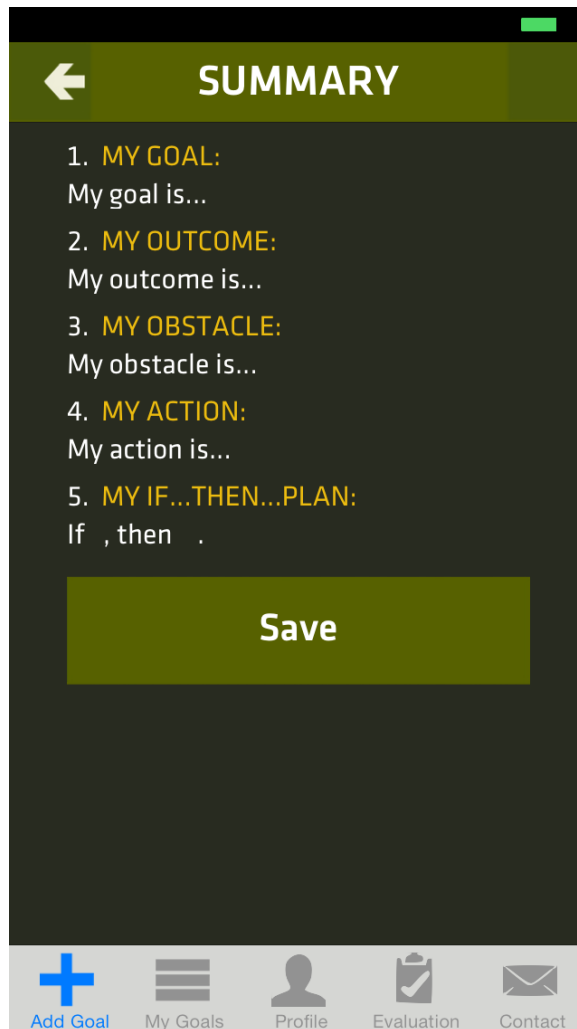
Figure A-13. Army Achieve Summary Screen.

Following the Summary screen, users could then track their goal progress by clicking on the My Goals icon in the menu portion of the application. Doing so would take them to the My Goals screen which would also allow them to add new goals. Figure A-14 depicts this screen. To enter progress in on existing goals, the user would select the goal from the list and then click on the appropriate percentage button related to their progress. The system would date and time stamp any entries for later analysis upon completion of the evaluation.
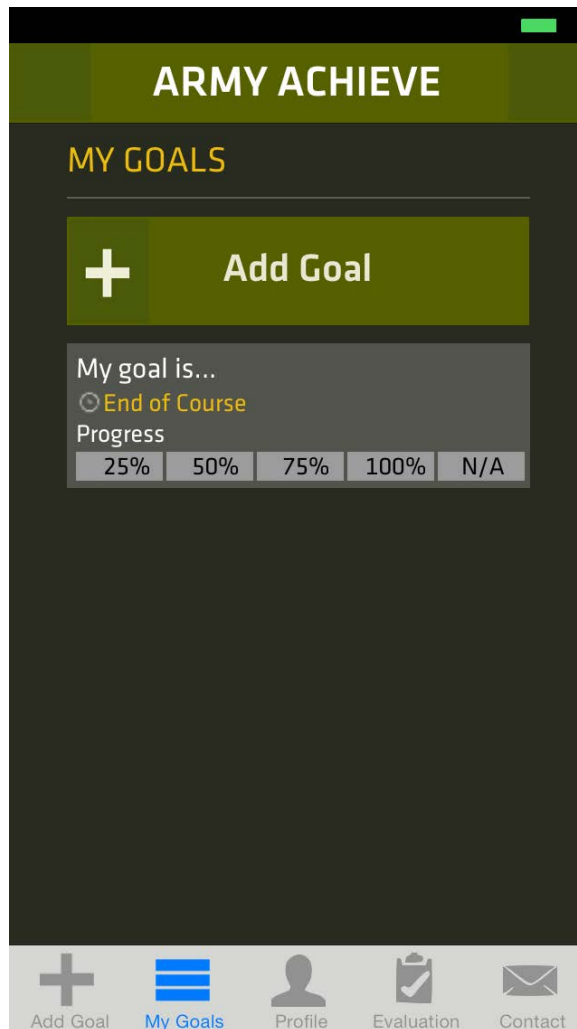
Figure A-14. Army Achieve My Goals screen.

Participants were asked to complete the evaluation after they had finished using the application. The evaluation items, presented in Table A-1 below, included nine items to be rated using a Likert-type agreement scale and three open-ended questions. Items 1-3 were analyzed as a composite scale associated with the "Utility of the Application," items 4-6 were associated with "Goal Approach" and items 7-9 were associated with "Motivation." Open ended responses were also analyzed for common themes. A partial depiction of the evaluation screen in the Army Achieve application appears as Figure A-15.

Table A-1
Evaluation Items and Scales

Item	Scale
1. I would recommend this application to other NCOs.	5-point agreement scale (Strongly Agree (SA), Agree (A), Neither Agree nor Disagree (N), Disagree (D), Strongly Disagree (SD)
2. The application was easy to use.	5-point agreement scale
3. I would like to continue to use the application in the future.	5-point agreement scale
4. The application changed my way of approaching challenges.	5-point agreement scale
5. The application helped me more clearly identify my course goals.	5-point agreement scale
6. The application helped prioritize my learning tasks.	5-point agreement scale
7. The application helped me learn more in this course.	5-point agreement scale
8. The application helped me be more involved in this course.	5-point agreement scale
9. The application helped me stay motivated to pursue my goals.	5-point agreement scale
10. The best thing about the application is:	Open response
11. Something that could be improved about the application is:	Open response
12. Other comments:	Open response

Figure A-15. Partial Depiction of Army Achieve Evaluation Screen.

After completing all items in the evaluation, the user could then click on the "Send" button at the bottom of the evaluation and an email message would be opened with the Army Evaluation Team address populated in the send line. Users could then send the email directly from any email return address they wished to use.

There was also a means by which users could contact the Evaluation Team with any problems or questions they had regarding the use of the application or completing the evaluation. A contact menu button took users to an open email message, prepopulated with the Evaluation Team email address. The users could type in any message and send the message from their chosen email address.

APPENDIX B

Screen Shots and Descriptions for the Army SMART Application

Appendix B: Army SMART Application

The purpose of the Army SMART application was to focus a goal setting and pursuit process that reflected the current Army Resiliency program goal setting process. This process, based upon the Army Goals Book (Department of the Army, Army Center for Enhanced Performance, n.d.), was considerably more complex than the process developed for the Army Achieve application and was therefore modified somewhat to provide a comparable application for evaluation purposes. This section describes the process and screens developed in the Army SMART application. Android and iPhone versions of the application screen had some slight differences, primarily due to screen size and menu locations. Android versions of the screen captures for each screen are provided in this section.

Home Screen

This screen provided a short introduction to the application to encourage participants to use the application. The only navigation instructions from this screen were to Add Goal, however, menu buttons related to My Goals, Profile, Evaluation and Contact were also visible. Upon clicking on any of the navigation buttons, a pop up window appeared that stated "Please enter your information on the Profile tab before adding a goal" and the user was taken to the Profile screen to complete Profile information upon selecting the "ok" button. The content for the home screen is presented as Figure B-1.
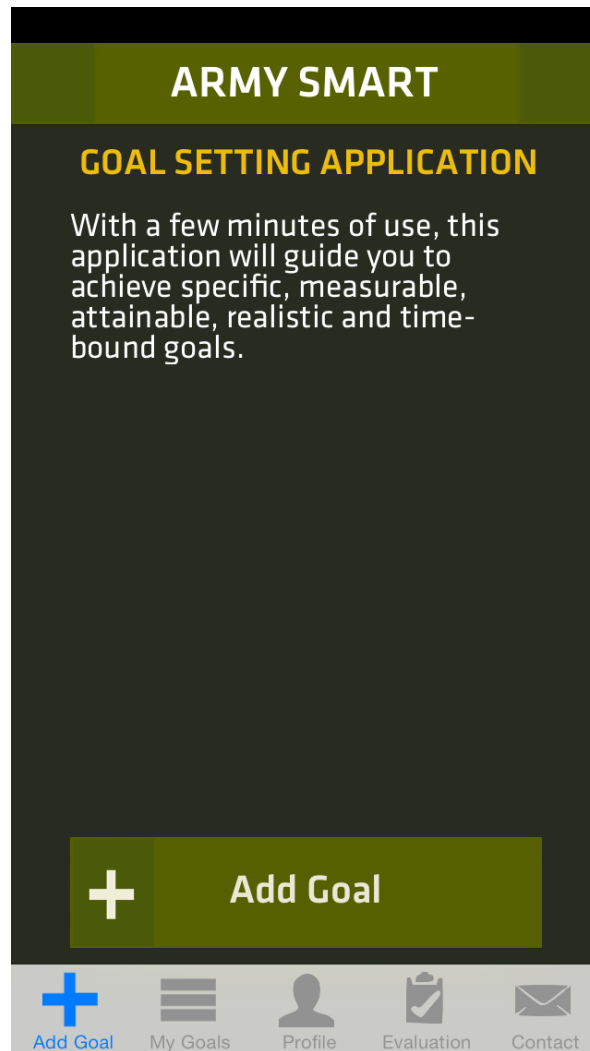
Figure B-1. Army SMART Home Screen.

Profile Information

The profile page was identical to the Army Achieve application. It was created to track evaluation participant data and consisted of drop down menus and text entry fields to make data entry as user-friendly as possible. This page appears as Figure B-2.
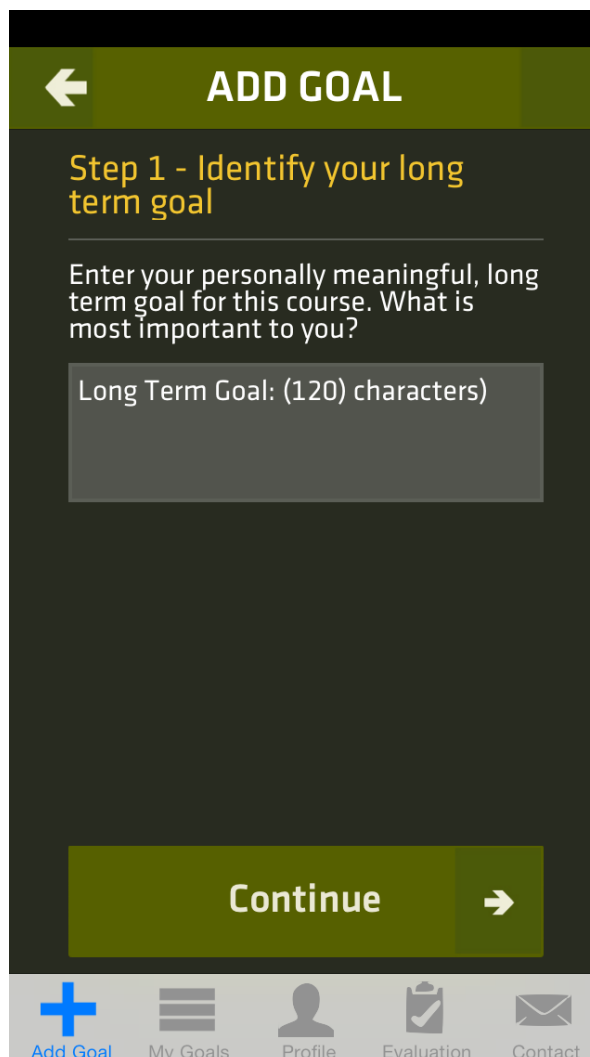
Figure B-2. Army SMART Profile Screen.

The profile page could be accessed at any time to update information. The following fields and user entry methods were included:

- Course (drop down menu with options for Basic Leader Course, Advanced Leader Course, Senior Leader Course)
- Rank (drop down menu with options for SPC/CPL, SGT, SSG, SFC)
- Field/MOS (free form text entry)
- Time in Service (free form entry into Years and Months fields).

For free form entry fields on this and all subsequent pages requiring free form text entry, clicking in the free form entry portion of the screen would open the users keyboard to enter any desired text. The smartphone's standard data editing and entry capabilities were enabled for text entry.

Add Goal

Once users completed entering all profile information and clicking on the return keyboard button, a pop up "Save" button would appear. After clicking on Save, users were then returned to the home page and the +Add Goal button would take users to the Add Goal screen. They would be prompted to identify a long term goal and enter the goal into a free form window. Users were allowed 120 characters for entering goal information in the SMART application versus the 60 characters that were available in the Achieve application. This was done intentionally. The SMART goal process typically requires more extensive input on the part of users compared to MCII. The Add Goal screen appears as Figure B-3. Identical in function to the Army Achieve application, a "Continue" button would appear at the bottom of each page following entry of the data.

Figure B-3. Army SMART Identify Your Long-Term Goal Screen.

Strengths

After the initial goal was entered, users would be taken to the Strengths screen and prompted to identify key strengths, skills, and qualities that will help them reach their goal. This screen appears as Figure B-4. Users were also prompted to enter key obstacles or challenges in the way of reaching their goal.

Figure B-4. Army SMART Application Strengths Screen.

Priority

The Priority screen came after the Strengths screen. It prompted users to identify something about themselves that they would like to work on to help them reach their goal. The Priority screen is depicted in Figure B-5.
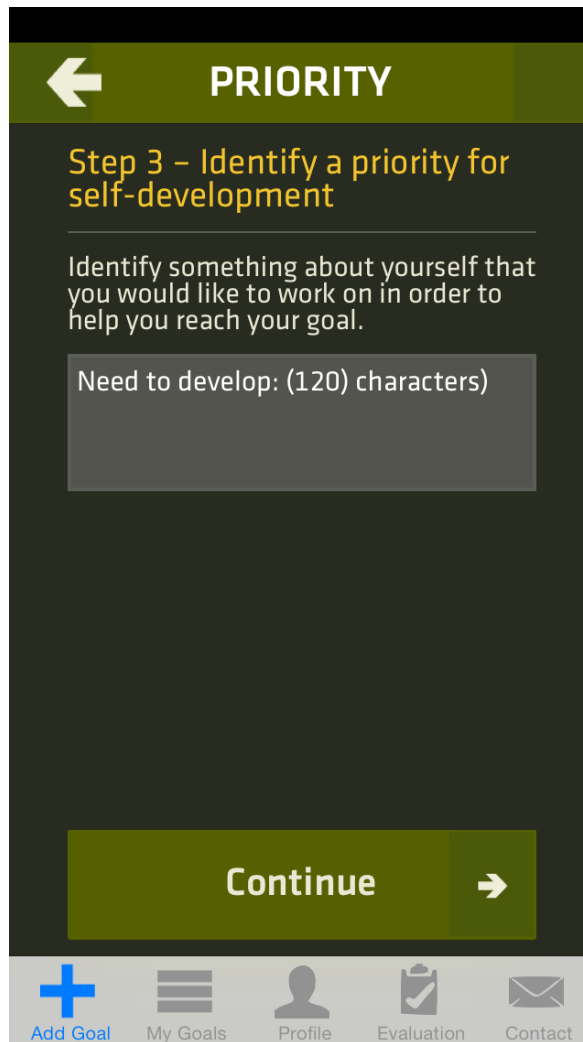
Figure B-5. Priority Screen from the Army SMART Application.

Action / Belief

　　Following entry of Priority, users were then taken to the Action / Belief screen and prompted to enter a key action that is specific, measurable, attainable, realistic and time-bound. It is on this screen that the SMART goal planning elements are most prominent in the application. In addition to the action, users were also prompted to enter a powerful and personally motivating belief. The Action / Belief screen is depicted in Figure B-6.

Figure B-6. Action and Belief Screen from the Army SMART Application.

Short Term Goals

After completing the Action/Belief screen, users were taken to the Short Term Goals screen. On this screen, users were prompted to enter one 24-hour and one 7-day goal associated with their outcome goal. They were further instructed that having short term goals will help them reach their long term goal. Free form fields were provided for the 24-hour and 7-day goals. This screen is depicted as Figure B-7.
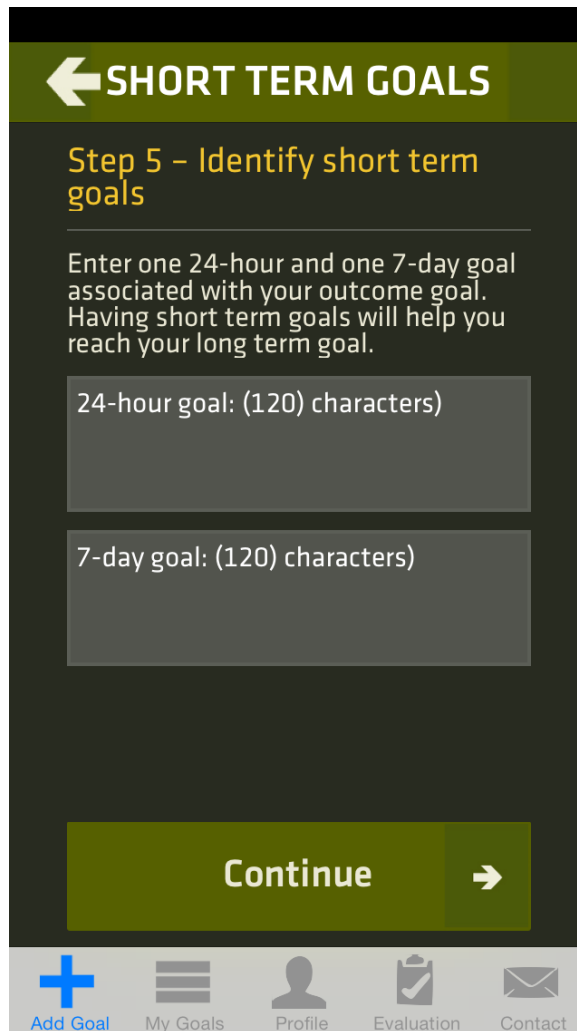
Figure B-7. Army SMART Application Short-Term Goals Screen.

Mindful

The final step in the SMART process was for users to enter what they would do that would help them be mindful of their goals. This screen is depicted in Figure B-8.
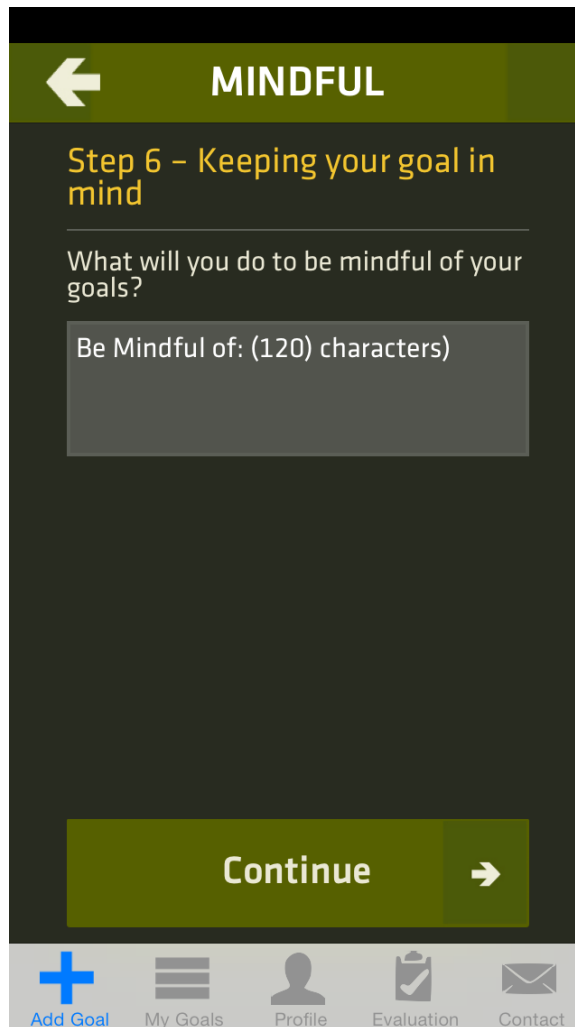
Figure B-8. Army SMART Application Mindful Screen.

Goal Summary

Following the completion of the Mindful screen, users were taken to the Goal Summary screen. The Summary screen consisted of the previously entered information as depicted in Figure B-9. The purpose of the Summary page was to provide a review of the information. There was no edit function built into the Summary page. The "Save" button took the user to the My Goals page and allowed the user to track their progress on the goal.
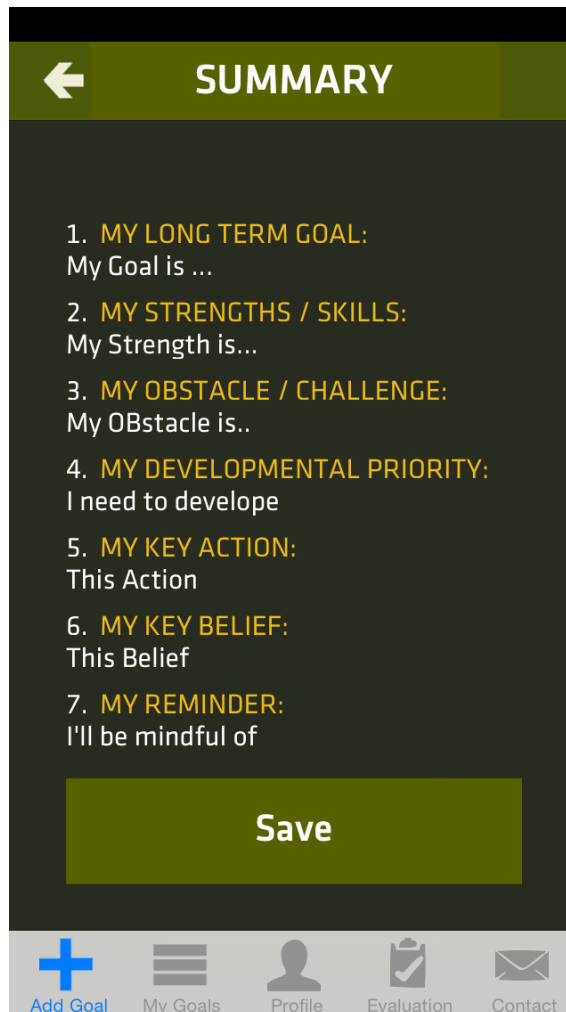
Figure B-9. Army SMART Application Summary Screen.

The remainder of the application functioned identically to the Army Achieve application in that users could access the My Goals screen to indicate progress on goals, and access the Evaluation screen to complete the application evaluation and email their results to the Research Team. In addition, users could contact the research team through the Contact screen.